Personality and Individual Differences 129 (2018) 159–165

Contents lists available at ScienceDirect

Personality and Individual Differences

journal homepage: www.elsevier.com/locate/paid

Susceptibility to the gambling near-win effect in optimists versus pessimists: An event-related potential study

Jie Xia, Daxing Wu*, Xin Xu

Medical Psychological Center, The Second Xiangya Hospital, Central South University, Changsha, Hunan 410011, China
Medical Psychological Institute of Central South Universty, Changsha, Hunan 410011, China
National Clinical Research Center on Mental Disorders, The Second Xiangya Hospital, Central South University, Changsha, Hunan 410011, China

ARTICLE INFO

Keywords:
Optimism
Pessimism
Near-win effect
Slot machine gambling

ABSTRACT

Near-win outcomes have a motivational effect on gambling behavior and are associated with gambling addiction. Information about the personality traits that determine susceptibility to the near-win effect is scare. Here, we assessed the event-related potentials (ERPs) and behavioral responses of 27 optimists and 25 pessimists following gambling outcomes in a modified slot-machine gambling task to examine whether optimists are more susceptible than pessimists to the near-win effect. The result showed that the mean amplitudes of analyzed ERPs elicited by near-win outcomes did not differ between the optimist and pessimist groups, but the groups exhibited different behavioral patterns in the task. The optimists tended to make risky bets following near-wins, whereas pessimists tend to be cautious. In addition, we observed a negative trend in the correlation between the probability of risky betting and the P300 amplitude difference between near-win and full-miss outcome trials in the pessimism group, but not in the optimism group. The present study revealed some potentially interesting differences in near win processing between the optimists and pessimists that may provide a foundation for future examination of individuals who are trait susceptible to the near-win effect and gambling addiction.

1. Introduction

The term near-win refers to a type of unsuccessful outcome in gambling that seems close to a win, but is still a loss (Reid, 1986). Near-win outcomes have been shown that have a motivational effect on gambling behavior and are associated with the addictiveness of gambling, which can motivate players to gamble more, bet more money, and experience a stronger desire to continue gambling (Clark, Lawrence, Astley-Jones, & Gray, 2009; Côté, Caron, Aubert, Desrochers, & Ladouceur, 2003). Evidence from neuroimaging studies indicates that near wins invigorate gambling by recruiting the same brain reward circuitry that responds to wins, especially in the ventral striatum (Clark et al., 2009). Thus, the near win has been regarded as an ambiguous outcome that could be perceived either as a win, owing to the subjective similarity in the brain's reaction to a win, or as a loss, due to the objective monetary loss. Although such findings help us to better understand behavioral and neurobiological responses to gambling near wins, little work has been done to identify the traits that produce augmented susceptibility to the near-win effect in gambling. Personality traits can affect how one interprets ambiguous information, which in turn can have strong effects on decision-making behavior (Byrne & Eysenck, 1993; Kuppens & Tuerlinckx, 2007; Weertman, Arntz, Schouten, & Dreessen, 2006).

Optimism and pessimism are enduring and stable personality traits. According to Scheier and Carver (1985), optimism and pessimism reflect a generalized expectation for good or poor outcomes, respectively. Thus, individuals with an optimistic predisposition may perceive ambiguous situations differently from those who tend to expect the worst. Accumulating evidence has supported this hypothesis and shown a reliable association between optimism and positive interpretations (Tali, 2011), especially of ambiguous cues (Gordon, Chesney, & Reiter, 2016). This optimistic interpretation bias leads to risk underestimation, a proclivity toward risky behaviors, and a lack of concern with taking preventative steps to avoid detrimental outcomes (Anderson & Galinsky, 2006). As such, it is plausible that optimists may feel that the near wins amount to frequently nearly winning rather than a series of losses and, given their generalized expectation for positive outcomes, that a win is coming to the next. Consequently, optimists may be more susceptible to the motivational effect of near wins in gambling. Indeed, Gibson and Sanbonmatsu (2004) demonstrated that, relative to pessimists, optimists maintain more positive gambling expectations and show a greater propensity to continue gambling after experiencing

* Corresponding author at: Medical Psychological Center, The Second Xiangya Hospital, Central South University, 139 Middle Renmin Road, Changsha, Hunan 410011, China.
E-mail address: wudaxing2017@csu.edu.cn (D. Wu).

https://doi.org/10.1016/j.paid.2018.03.032
Received 14 October 2017; Received in revised form 13 March 2018; Accepted 17 March 2018

negative outcomes. However, the potential influence that optimism may exert on the near-win effect specifically in gambling has never been investigated.

The event-related potentials (ERPs), extracting from the electroencephalography (EEG), is a widely used electrophysiological technique for studying real-time aspects of cognitive processes. ERPs consist of a series of negative- and positive-going components shown to reflect different aspects and stages of cognition and to vary based on extent of information processing (Macar & Vidal, 2004). Two main ERP components related to outcome evaluation in gambling tasks are the feedback-related negativity (FRN) and the P300. The FRN is a negative deflection detected from frontal-central recording sites, peaking 200–300 ms after negative feedback stimulus delivery (Miltner, Braun, & Coles, 1997), such as monetary losses in gambling tasks (Gehring & Willoughby, 2002; Hajcak, Moser, Holroyd, & Simons, 2007). The P300 is a positive-going potential with a central-parietal midline prominence and a typical latency of 300–500 ms after the onset of the feedback stimulus. In gambling games, the P300 is sensitive to various outcome aspects, including valence and magnitude (Hajcak et al., 2007; Yeung & Sanfey, 2004). ERP studies have indicated that near-win trials are associated with more positive FRN and P300 amplitudes than full-miss trials, even though they result in the same monetary outcomes, supporting prior behavioral and neuroimaging findings in suggesting that the two types of trials are processed in distinct ways (Lole, Gonsalvez, Barry, & De Blasio, 2013; Qi, Ding, Song, & Yang, 2011). These studies also provide proof of the principle that ERP analysis is a reliable, sensitive method for investigating the neural correlates of cognitive responses to near wins.

The aim of the present study was to examine whether optimists are hypersensitive to the near-win effect in gambling. To this end, we evaluated behavioral responses and ERPs following near-win and full-miss outcomes in optimism and pessimism groups performing a simulated gambling task. Given the optimist positive bias in ambiguity interpretation and propensity toward high-risk decision behavior, we expected that optimists would be more susceptible to the near-win effect than pessimists. Specifically, we hypothesized that our optimist group would evaluate near wins more positively than full misses and also more positively than pessimists would evaluate them, as reflected by more pronounced ERP component amplitudes. We also hypothesized that, relative to the pessimist group, the optimist group would exhibit riskier behavior, such as increasing bets following near wins.

2. Materials and methods

2.1. Participants

Our institutional ethics committee approved the study protocol, and all participants provided informed consent. The sample was recruited from a pool of 856 students attending one of three universities in Changsha, China, who completed a brief demographic questionnaire. The participants were also asked to complete Chinese versions of the short-form Optimism and Pessimism Scale (OPS-C-SF) (Xia, Wu, Zhang, Xu, & Xu, 2014), the South Oaks Gambling Screen (SOGS) (Lesieur & Blume, 1987), the revised Life Orientation Test (LOT-R) (Lai, Cheung, Lee, & Yu, 1998), and the 21-item Depression Anxiety and Stress Scale (DASS-21) (Wen et al., 2012). The OPS-C-SF was used as a screening tool to assess dispositional optimism. Individuals whose OPS-C-SF scores fell within the top 16% and bottom 16% were considered to be optimistic and pessimistic, respectively (Zhang, Wu, Yao, Xu, & Lu, 2013). The CLOT-R, another assessment of dispositional optimism, was used to validate group classification. The SOGS was used to assess diagnostic status and gambling behavior severity, where individuals who obtained a score ≥ 3 were flagged as being at risk of having an extant gambling problem and excluded from this study. The DASS-21 was adopted to assess participants' depression, anxiety, and stress levels, given the fact that those negative emotions were reported to significantly affect the gambling behavior (Blaszczynski & Mcconaghy, 1989). Participants whose total DASS-21 scores exceeded 21 points were excluded. After excluding individuals for SOGS and DASS-21 scores suggestive of excessive gambling behavior and emotional disorders, respectively, we selected 29 individuals to form a provisional optimism group and 26 individuals to form a provisional pessimism group. Final group selection from the pools of participants with optimist and pessimist OPS-C-SF scores was based on matching of demographic variables (sex and age) and DASS-21 subscale scores. Before the final analysis, one participant in the optimism group was excluded due to missing data and one participant in each group was excluded due to an insufficient trial number (< 30 per condition). Therefore, the final sample consisted of 27 optimists (male: 15; female: 12) and 25 pessimists (male: 12; female: 13), ranging in age from 17 to 24 years with a mean age of 19.42 years [standard deviation (SD) = 1.50 years]. The demographic characteristics of and psychometric results for each group are reported and compared in Table 1.

Table 1
Comparison of demographic characteristics and mean psychometric test scores, with SDs, of the optimist and pessimist groups.

Characteristic	Optimists	Pessimists	t/χ2	*P*
Mean age, y	19.67 (1.64)	19.00 (1.32)	1.605	0.115
Gender, males: females	17:10	12:13	0.297	0.586
Mean psychometric test scores				
OPS-C-SF	72.52(2.82)	50.99(5.48)	18.02	< 0.001
CLOT-O	13.48(1.50)	10.56(2.02)	5.94	< 0.001
CLOT-P	4.04(1.40)	7.44(2.29)	−6.40	< 0.001
SOGS	0.86(0.82)	0.75(0.81)	0.51	0.610
DASS-D	3.11(2.03)	3.66(1.95)	−0.99	0.328
DASS-A	3.48(2.19)	3.86(1.66)	−0.71	0.484
DASS-S	4.07(2.25)	4.79(1.62)	−1.31	0.196

Note: CLOT-O and -P are the optimism and pessimism subscales of the CLOT-R, respectively. DASS-D, −A, -S are the depression, anxiety, and stress subscales of DASS-21, respectively.

2.2. Task

A modified slot-machine gambling task was presented through *E*-Prime v1.1 software (Psychology Software Tools, Pittsburg, PA). Prior to the session, participants were given verbal instructions about the rules of the game. They started with a free allocation of 500 credits (converted to 50 Chinese Renminbi, ≈ US $8.05) for their participation, and how much they would be awarded or penalized relative to their starting payment depended on their performance in the gambling task. Thus, they had a financial incentive to try their best to earn as many credits as possible. As shown in Fig. 1, at the beginning of each trial, participants were given the option to choose to “Bet 1” or “Bet 10” by pressing the F or J button on a standard computer keyboard, respectively. Then, the backs of four cards were shown for 800-ms, after which the card-drafting program flipped the four virtual cards simultaneously, revealing fruit images on the faces of the cards, and thus the outcome of the trial. According to the icons and sequence of the four fruit cards, one of four trial outcomes was possible: four identical icons indicated a big win, yielding a 10-fold return on the bet; three identical icons in sequence indicated a win, yielding a 5-fold return on the bet; one different icon inserted among three identical icons indicated a near win, yielding no credits; and the remaining outcomes were full misses, yielding no credits. The outcome screen remained visible for 1200 ms before the next trial commenced. The amount won or lost in last trial and the total remaining credits were then displayed prominently on betting interface screen, below the aforementioned bet options for the next trial. The outcomes occurred pseudo-randomly according to their stated probabilities (big win, 7.5%; win, 7.5%; near win, 15%; and full miss, 70%), similar to a real electronic gambling machine (Wilkes, Gonsalvez, & Blaszczynski, 2010). The task contained six blocks of 160